

REMARKS

Claims 1-18 are pending in the current application. Claim 1 is in independent form. No new matter has been added. In view of the following remarks, favorable reconsideration and allowance of the present application is respectfully requested.

Initially, Applicants appreciate the Examiner's acknowledgment that all certified copies pertaining to foreign priority claimed under 35 U.S.C. §119 have been received, acceptance of the drawings filed on June 20, 2005 and the indication that the references submitted in the Information Disclosure Statement filed on June 20, 2005 have been considered.

Furthermore, Applicants note that the Office Action Summary indicates that the instant Specification is objected to by the Examiner. However, there are no objections mentioned in the Detailed Action. Thus, unless indicated otherwise in the next Patent Office communication, Applicants will assume that the Specification is acceptable.

I. **Status of Priority Application**

Applicants submit that the present application is a PCT National Stage Application of PCT/DE2003/004127 filed December 15, 2003, which claims the benefit of priority from German Patent Application DE 102 59 820.7 filed in Germany on December 19, 2002. Applicants respectfully submit that German Patent Application DE 102 59 820.7, which includes similar claims as the pending claims in the present application, has been granted.

II. 35 U.S.C. §112, SECOND PARAGRAPH REJECTION

Claims 7 and 15 stand rejected under 35 U.S.C. §112, second paragraph as allegedly being indefinite for failing to point out and distinctly claim the subject matter regarded as the invention. Applicants respectfully traverse the rejection.

Namely, the rejection states that "...the phrase 'pointlike' renders the claim(s) indefinite because the claim(s) include(s) elements not actually disclosed (those encompassed by the 'or the like'), thereby rendering the scope of the claim(s) unascertainable. See MPEP §2173.05(d)." Action, p. 2.

However, Applicants submit that the term "pointlike" is an adjective describing the individual electrodes recited in claims 7 and 15, not exemplarily claim language as discussed in MPEP §2173.05(d).

Furthermore, paragraph [0036] of the Specification states that "[e]ach individual electrode 28 contains a pointlike electrode head 30 that is connected to the electrode collective line 26 with the aid of an electrical plated-through hole 32." Thus, Applicants submit that the elements disclosed in the claims are disclosed. Thus, the scope of the claims is ascertainable.

For at least these reasons, Applicants respectfully request that the Examiner reconsider and withdraw the §112, second paragraph rejection to claims 7 and 15.

III. EXAMPLE EMBODIMENTS

Example embodiments are directed to a DNA chip including a microarray of spots having a thin-film for four-pole impedance spectroscopy using two polarization electrodes and two sensor electrodes. According to example embodiments, the measurements are formed using an alternating current (AC).

Furthermore, the polarization electrodes are installed on the outside (as seen from the center line shown in Fig. 1) of the spot, and the sensor electrodes are installed in the center of the spot. Current flows through the polarization electrodes. The voltage is measured without current at the sensor electrodes.

According to exemplary embodiments, the sensor electrodes may be pointlike or strip electrodes. The polarization electrodes may be interdigital shaped electrodes.

IV. CITED ART GROUNDS OF REJECTION

Claims 1, 2, 6-12 and 14-18 stand rejected under 35 U.S.C. §103(a) as allegedly being unpatentable over Albers et al. (hereinafter "Albers"), WO 00/62048 (U.S. equivalent being U.S. Patent No. 7,208,077 B1) in view of Frazier et al. (hereinafter "Frazier"), U.S. Patent No. 6,169,394 B1; and claims 3-5 and 13 stand rejected under 35 U.S.C. §103(a) as allegedly being unpatentable over Albers in view of Frazier and further in view of Gau, WO 01/183674 A1. Applicants respectfully traverse the rejections.

Applicants acknowledge the obligation under 37 C.F.R. §1.56 to point out the inventor and invention dates of each claim that was not commonly owned at the time a later invention was made.

A. INDEPENDENT CLAIM 1

Independent claim 1 is directed to a DNA chip including (*inter alia*) a microarray of spots, each spot containing a thin-film four pole system including “two polarization electrodes for generating an alternating electromagnetic field and two sensor electrodes for measuring a voltage drop in the analyte.” Non-limiting, example embodiments may be found, for example, in paragraphs [0028] and [0029] of the Specification, as originally-filed. Applicants submit that the art relied upon by the Examiner fails to teach, or suggest, the above features recited in independent claim 1.

i. THE COMBINATION OF ALBERS AND FRAZIER

As acknowledged on page 3 of the Action, “...Albers et al. ('077) does not specifically disclose two polarization and two sensor electrodes...” Rather, the electrodes in Albers permit only a two-pole impedance measurement, similar to the conventional art. In a two-pole impedance measurement, polarization effects at the electrodes result in measurement errors. Namely, the two-pole impedance measurement does not function well for physiological solutions that have a relatively high salt content. The high salt content results in especially strong polarization effects at the electrodes.

Furthermore, Albers teaches that interdigital electrodes are used for redox recycling (*i.e.*, oxygen metabolism) using direct current (DC). An adjustment occurs via the reference electrode and the backplate electrode, which are installed outside of the interdigital electrode. In the system according to Albers, only the reference electrode is an electrode without current. Current flows via the backplate electrode and the interdigital electrode.

Applicants submit that a precise measurement of the potential difference via the interdigital electrode would not be possible because the interlocking finger system measures the potential differences determined at different locations. The interlocking fingers of the electrodes mutually compensate for their potential differences. The voltage between the main connectors of the electrodes is distorted. As such, the electrode configuration taught by Albers is used only for redox recycling.

Two planar electrodes with minimal surface area are generally used for measuring the potential difference in a two-pole impedance measurement.

Furthermore, Applicants submit that one skilled in the art would not be motivated to combine the teachings of Albers and Frazier due to the difference in the form, arrangement and function of the electrodes. Namely, Albers discloses a CMOS chip with interdigital electrodes positioned flat on the surface of the chip. Frazier discloses electrodes that project into a microchannel.

Referring to Fig. 1, Frazier, directed to micro-electric detector, teaches that “[a] first pair of low impedance electrodes 16 are formed on sidewalls 14 at a selected location along microchannel 12 such that electrodes 16 face each other.” Frazier, col. 6, ll. 15-17. Thus, the electrodes 16 are in a round flow channel, not formed on the planar surface of a chip as taught by Albers.

Referring to Fig. 2B, Applicants submit that the electrode tips 50 of the detector electrodes 46 project into the microchannel 35. Applicants submit that the electrodes in Frazier do not permit measurement like a planar microelectrode system.

Furthermore, the electrodes taught by Frazier have different field distributions and measuring characteristics, and have a different purpose (*i.e.*, to manipulate cells in a flow channel).

Applicants submit that one having ordinary skill in the art would not be motivated to use the projecting electrode arrangement for a microchannel as taught by Frazier in place of the planar electrodes on the DNA-CMOS chip taught by Albers.

For at least these reasons, Applicants submit that there is no motivation to combine the teachings of Albers and Frazier.

As such, Applicants submit that Albers in view of Frazier fails to teach, or suggest, “the thin-film four pole system including two polarization electrodes for generating an alternating electromagnetic field and two sensor electrodes for measuring a voltage drop in the analyte” as recited in independent claim 1.

Thus, Applicants respectfully request that the Examiner reconsider and withdraw the rejection to independent claim 1, and claims 2-18 at least by virtue of their dependency on independent claim 1.

B. DEPENDENT CLAIM 3

Dependent claim 3 is directed to the DNA chip as claimed in claim 1 wherein “at least one sensor electrode is assigned a shielding electrode.” Applicants submit that the art relied upon by the Examiner fails to teach, or suggest, the above feature recited in claim 3.

i. GAU

The rejection states that “...Albers et al ('077) does not disclose a shielding electrode. However, it is well known in the art that a reference electrode of which the examiner deems to be equivalent to a shielding electrode performs the same function as described in Gau ('674) wherein at least one working electrode which is equivalent to a sensor electrode is assigned a reference electrode, which is used to control the potential differences between the working electrode and the reference electrode (Page 2, lines 24-38; Pages 9-10).” Action, pp. 6-7.

However, Applicants submit that no current flows over a reference electrode. That is, a reference electrode is designed for measuring voltage without current. Furthermore, a reference electrode does not reduce parasitic capacitance, or protect sensor electrodes.

Thus, Applicants submit that a reference electrode is not equivalent to a shielding electrode.

As such, Applicants submit that Albers in view of Frazier and further in view of Gau fails to teach, or suggest, “at least one sensor electrode is assigned a shielding electrode” as recited in dependent claim 3.

Thus, Applicants submit that dependent claim 3 is allowable over the cited art for its own merits, as well as, by virtue of its dependency on independent claim 1.

Accordingly, Applicants respectfully request reconsideration and withdrawal of the rejection to dependent claim 3, and claims 4 and 5 by virtue of their dependency on claim 3.

C. DEPENDENT CLAIM 13

Dependent claim 13 is directed to the DNA chip as claimed in claim 2 wherein “at least one sensor electrode is assigned a shielding electrode.” Applicants submit that dependent claim 13 is patentable over the cited art for similar reasons as given above with respect to dependent claim 3, as well as by virtue of its dependency on independent claim 1.

CONCLUSION

Accordingly, in view of the above, reconsideration of the rejections and allowance of each of claims 1-18 in connection with the present application is earnestly solicited.

Pursuant to 37 C.F.R. §§1.17 and 1.136(a), Applicants hereby petition for a two (2) month extension of time for filing a reply to the outstanding Office Action and submit the required \$460.00 extension fee herewith.

Should there be any matters that need to be resolved in the present application; the Examiner is respectfully requested to contact the undersigned at the telephone number below.

If necessary, the Commissioner is hereby authorized in this, concurrent, and future replies, to charge payment or credit any overpayment to Deposit Account No. 08-0750 for any additional fees required under 37 C.F.R. § 1.16 or under 37 C.F.R. § 1.17; particularly, extension of time fees.

Respectfully submitted,

HARNESS, DICKEY, & PIERCE, P.L.C.

By  55,149
for Donald J. Daley, Reg. No. 35,416

DJD/CDW:psy

P.O. Box 8910
Reston, Virginia 20195
(703) 668-8000